
MAX IV

MaxIV Laboratory
A Review of Automated and Self-Operating Processes

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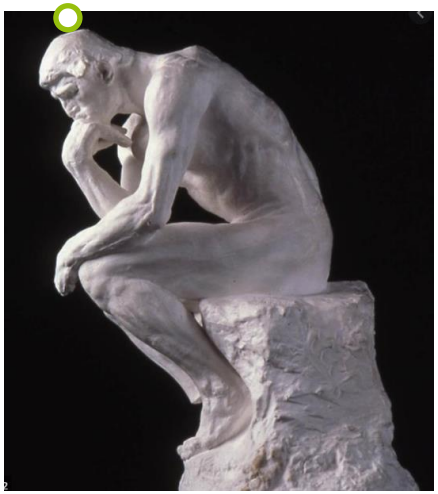
Automation, Automatization, semi-autonomous systems, manipulators, ML, AI...

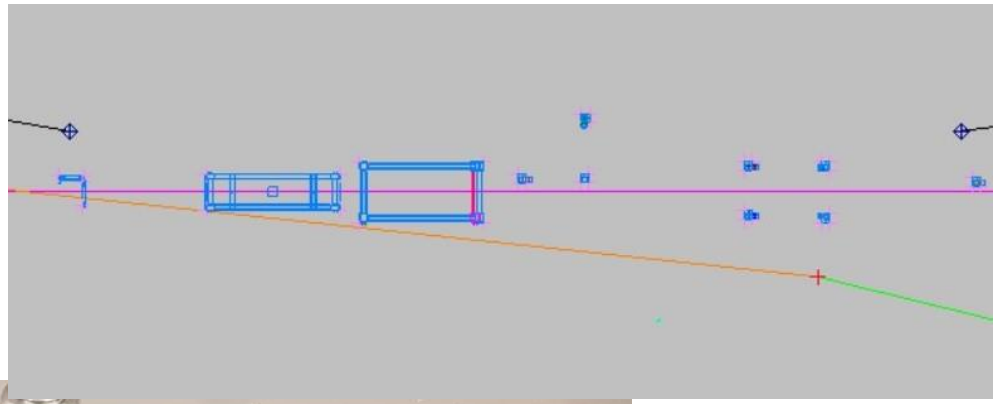
- Robot B.O.R.I.S. and its future
- Beamlines' solutions and their wishes
- ID lab (wire stretching towers)
- ML, AI, Administration (ok, and now what? Spoiler)



Robot B.O.R.I.S. at MaxIV

Introduction

Bluelining is a technique of transferring a three-dimensional (3D) computer model into real space.



Introduction

The current manual bluelining process for such machines has some disadvantages that need to be improved:

- **Precision:** can be around 2-5 mm
- **Speed:** The process is relatively slow; since each point has to be treated individually and manually.
- **Worker comfort:** The manual nature of the process can also create discomfort for workers.
- **Unhealthy Working Environment:** Sometimes the working environment can be unhealthy for humans (construction dust) or not accessible for a long time

Solution

A bluelining robot would improve the existing bluelining method significantly.

We developed a **high-precision self-positioning robot** that simplifies the work by automatically driving to the location specified by a computer and marking that position with a dot and lines.

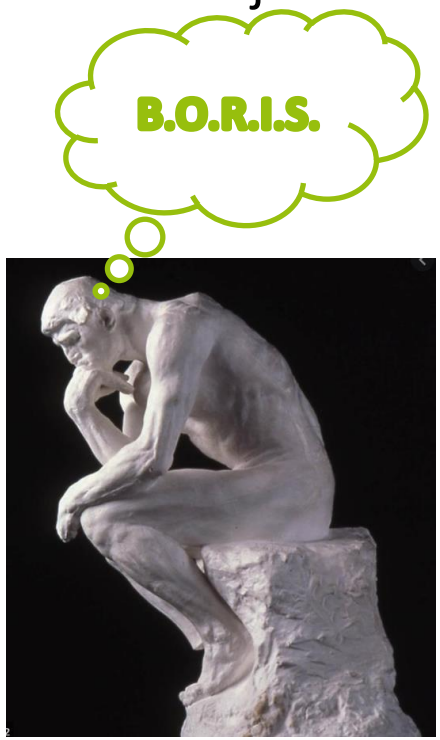
Where to start?

Projects.
Concept design -> Prototyping-> Tests

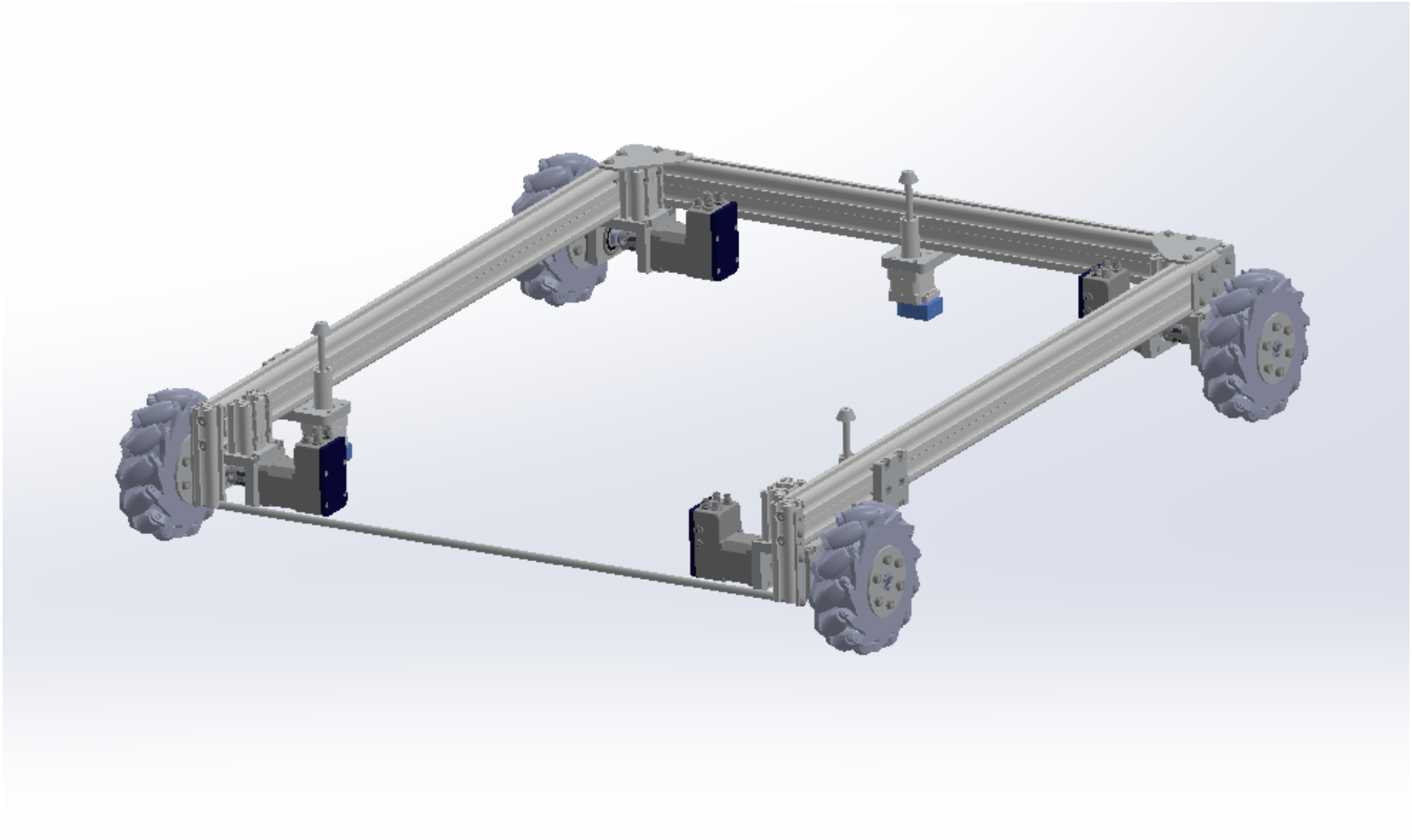
The primary prototype is divided into two main parts:

a **manipulator** and a so-called **"taxi"**

The mobile platform “taxi” is transporting the robot and the manipulator, who will actually perform the job.

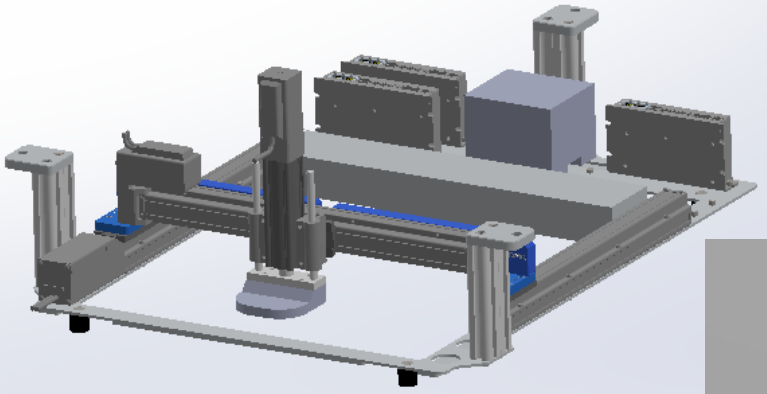


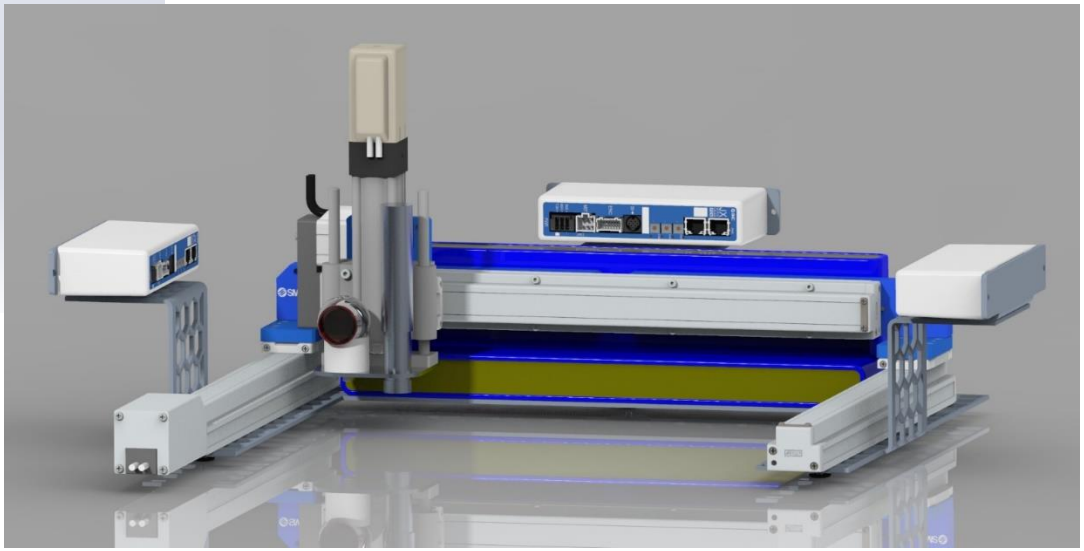
Delivery platform (Taxi)
First stage of positioning



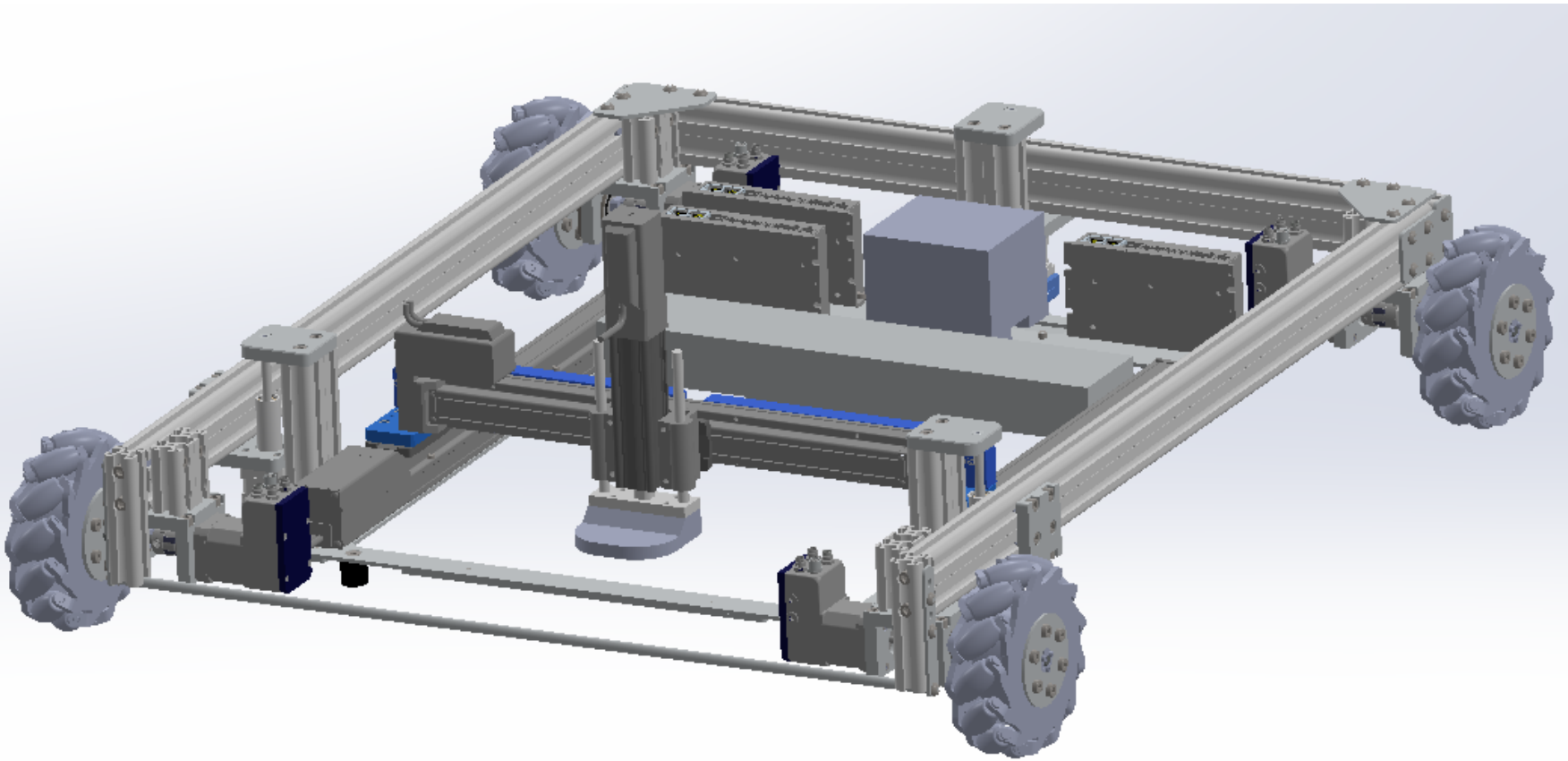
Manipulator

The manipulator is the most accurate and precise sub-robot.





B.O.R.I.S.



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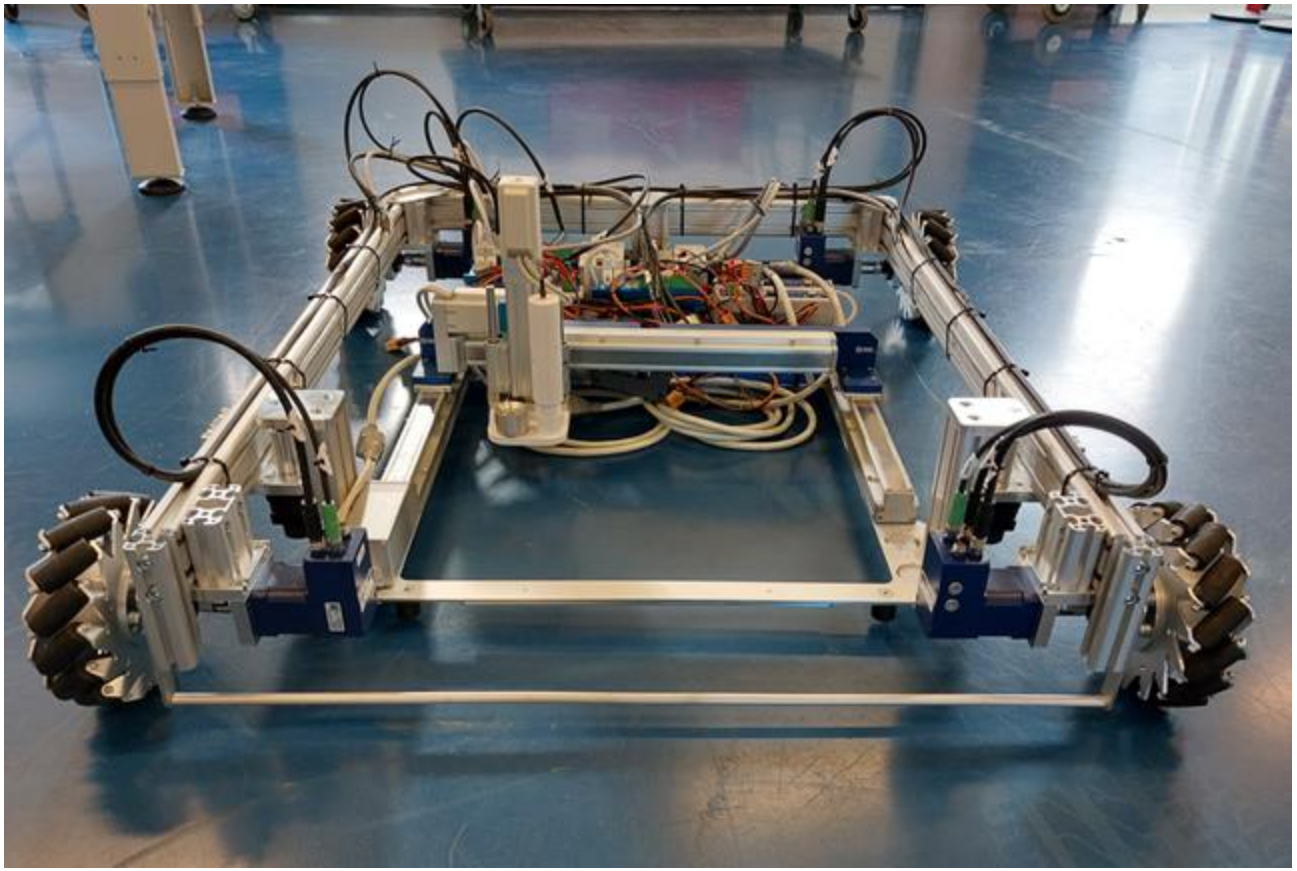
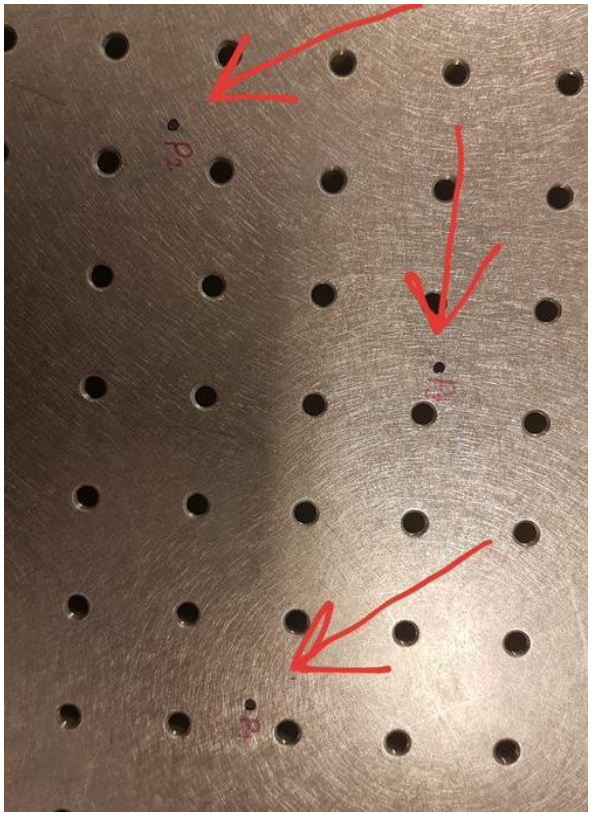
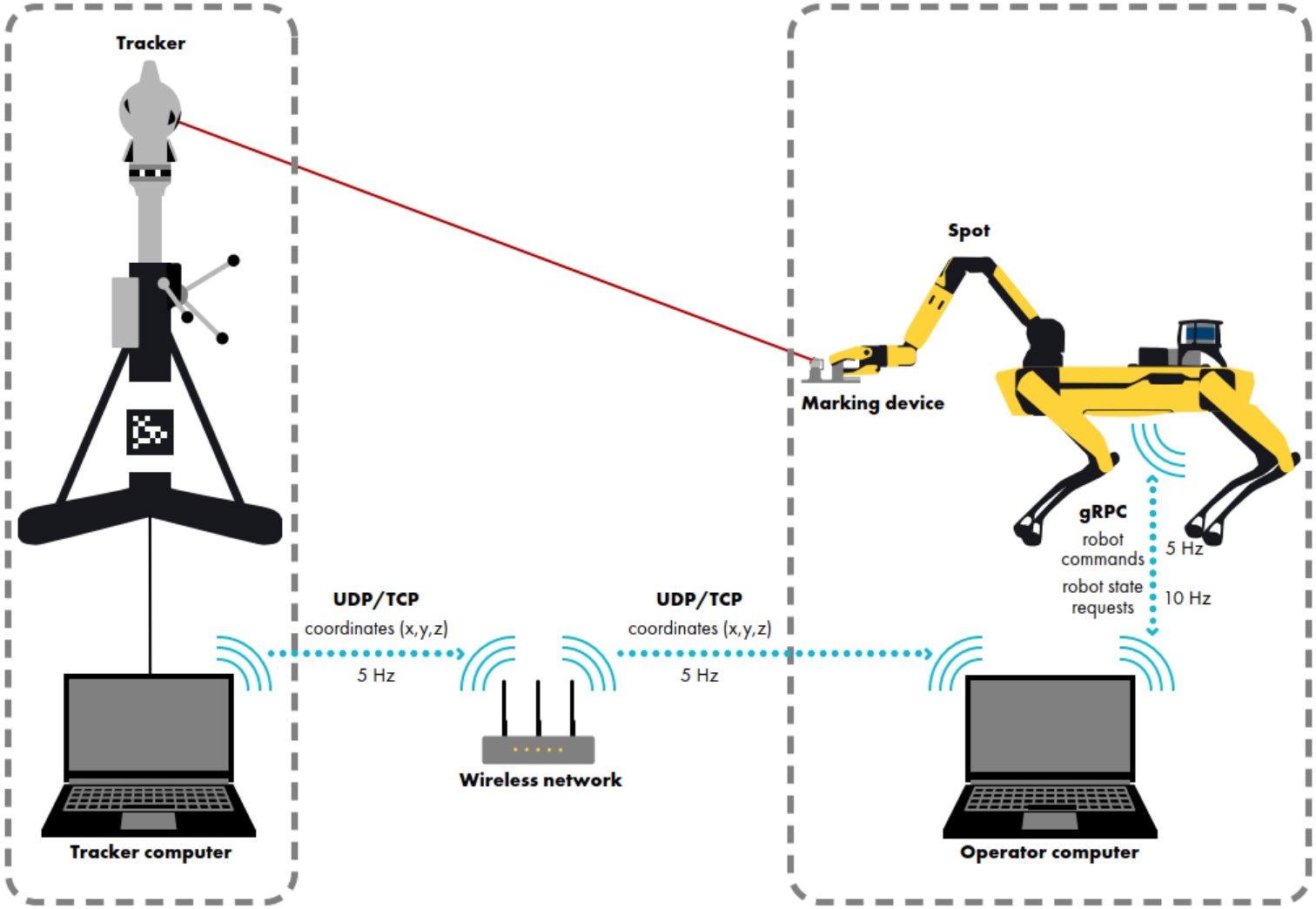


Test results

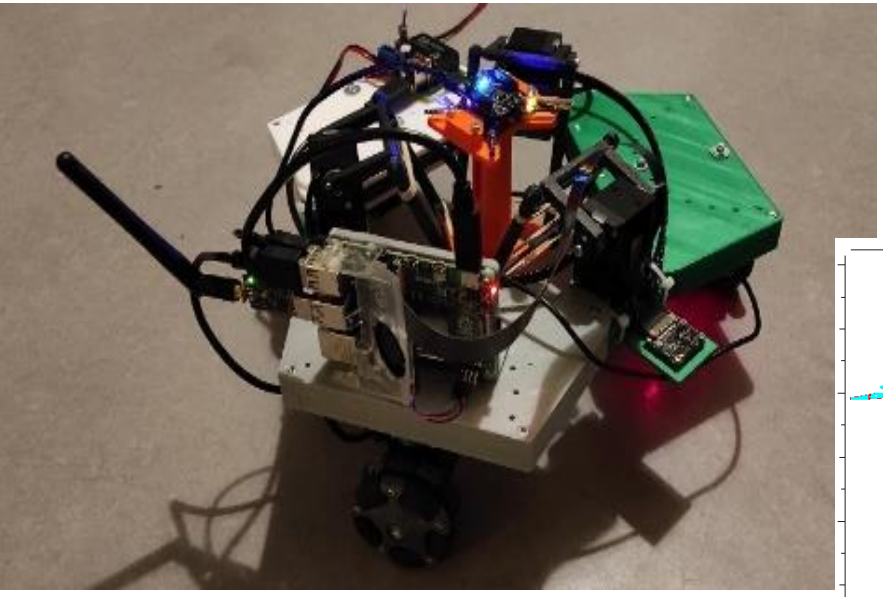


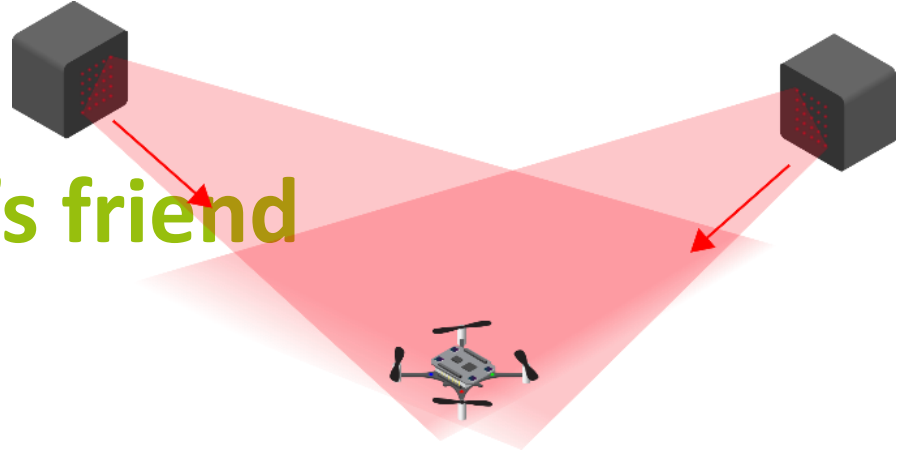
B.O.R.I.S.’s friend

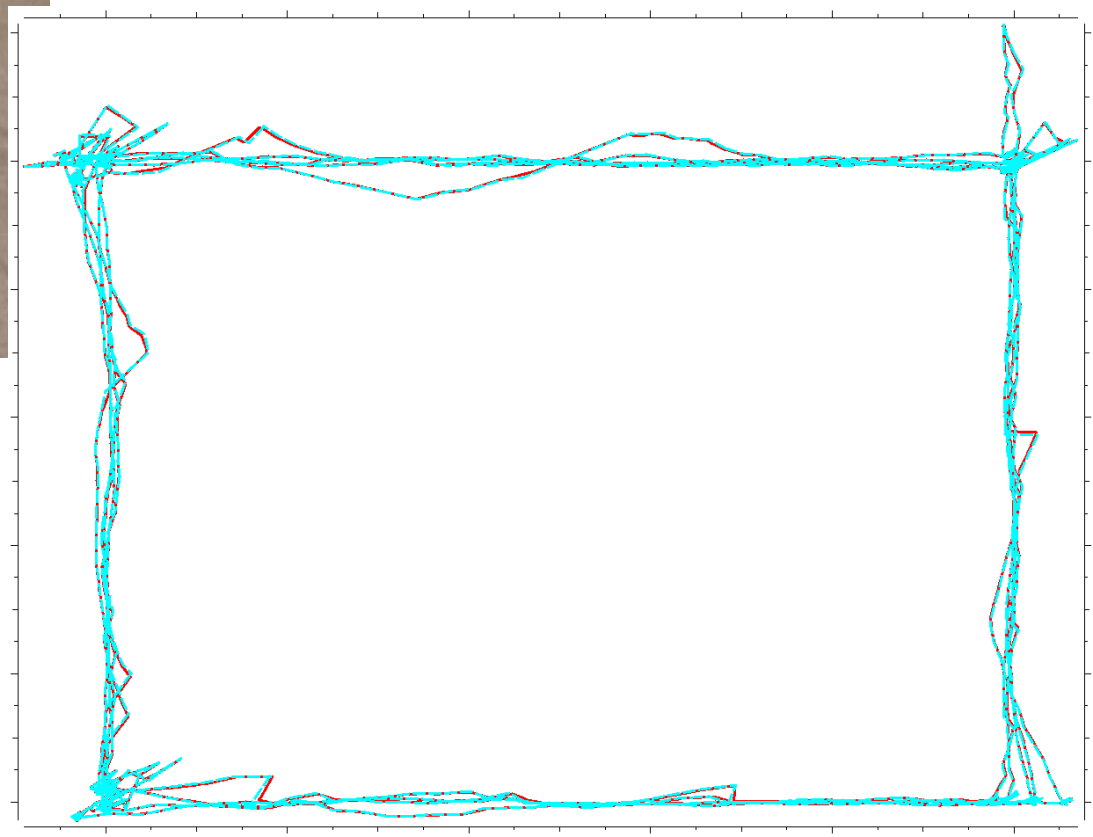
B.O.R.I.S.'s friend



B.O.R.I.S.'s friend







BioMAX Experimental Hutch

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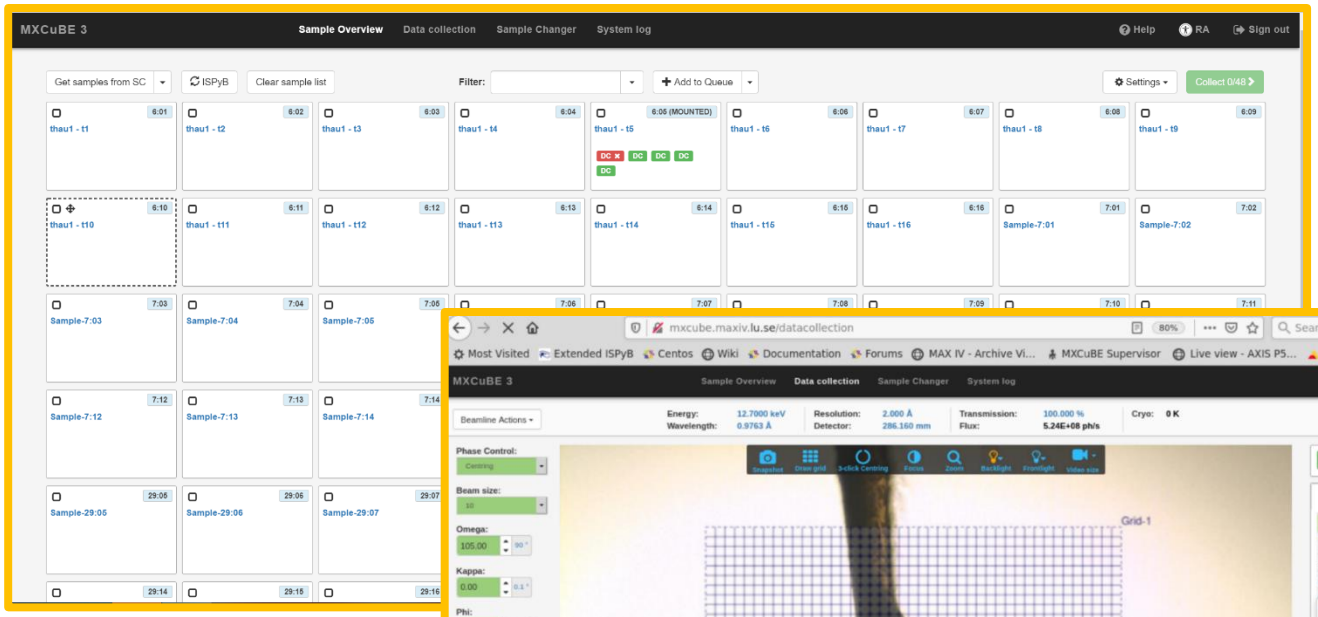
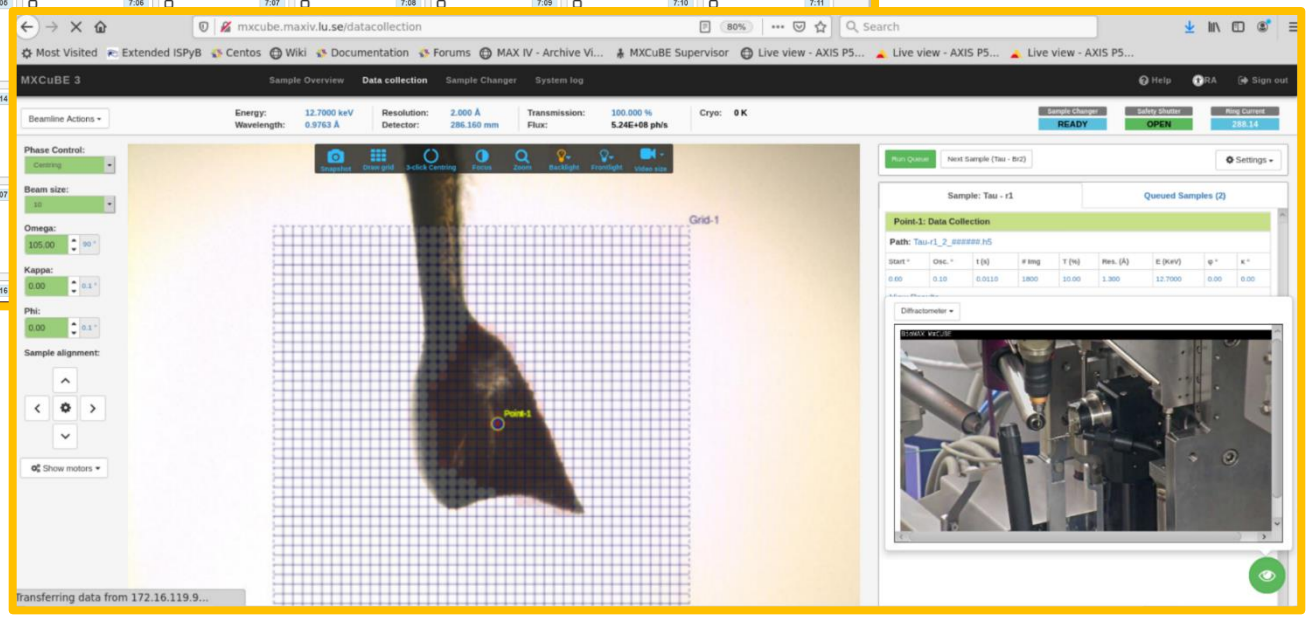
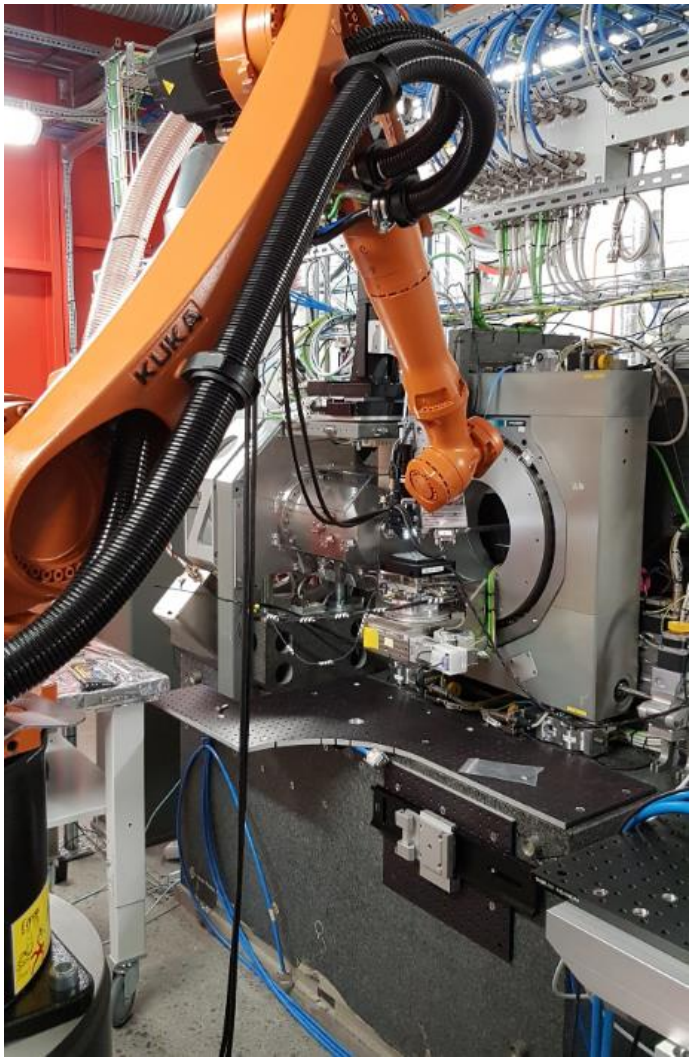


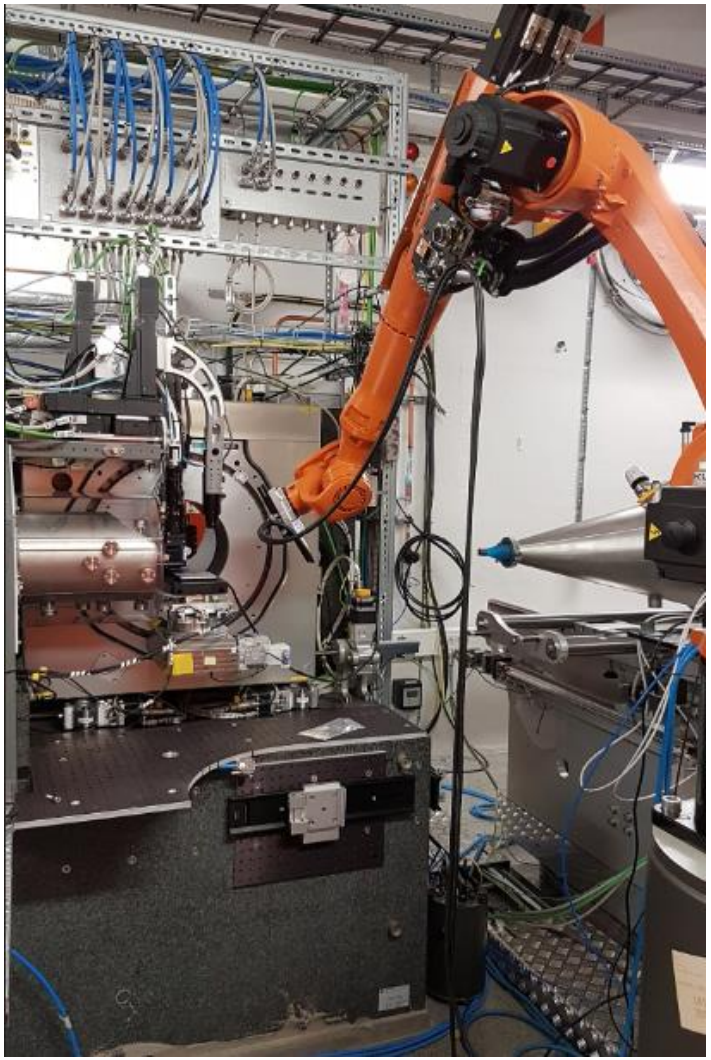
SampleView Interface



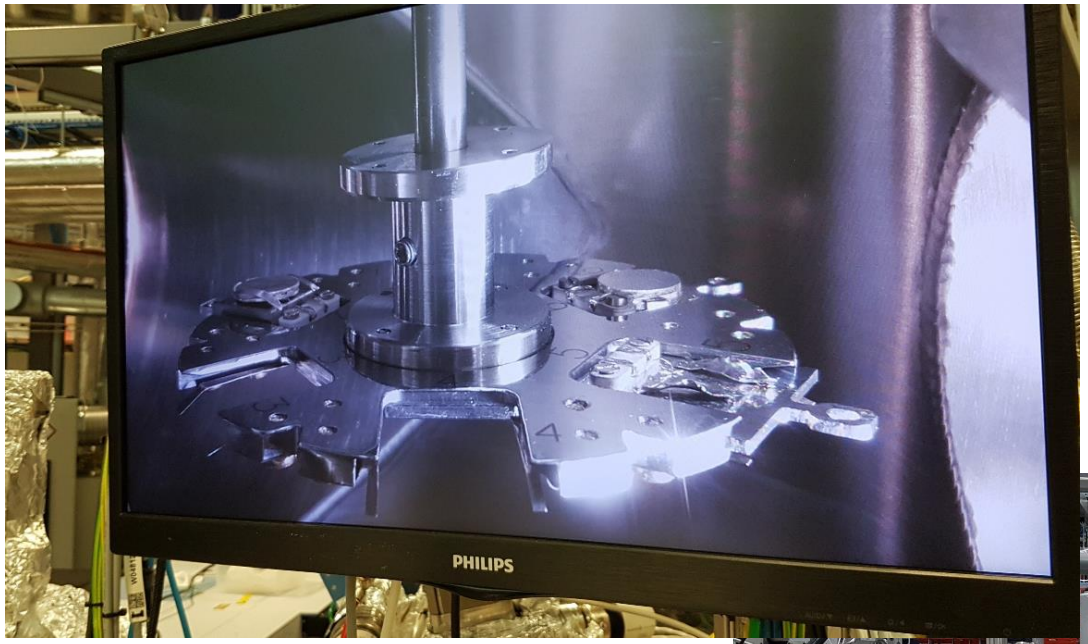
DataCollection Interface

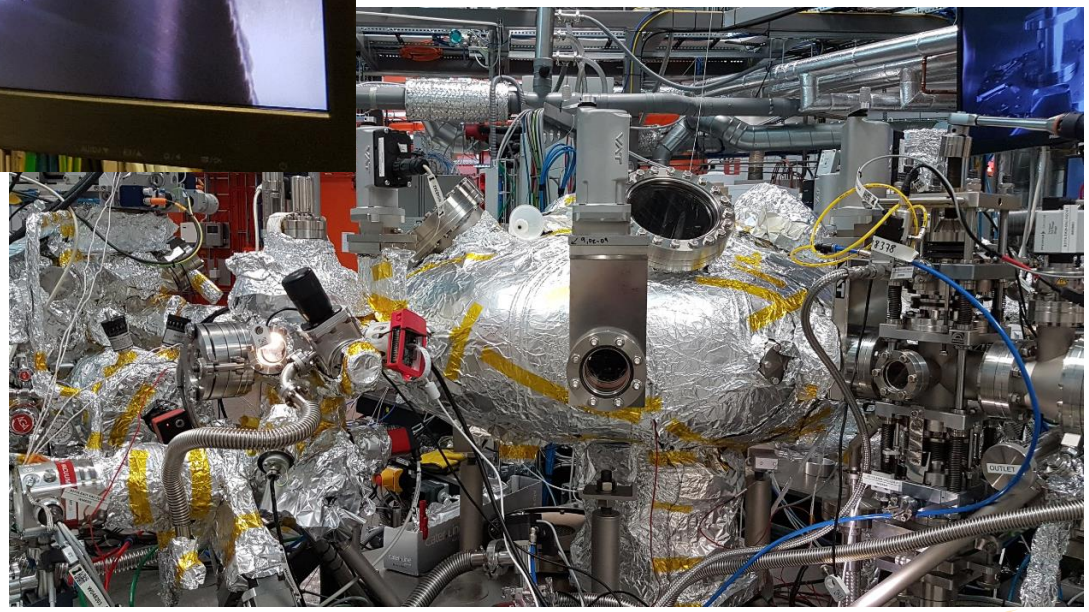
NanoMAX Experimental Hutch





HIPPIE End Station

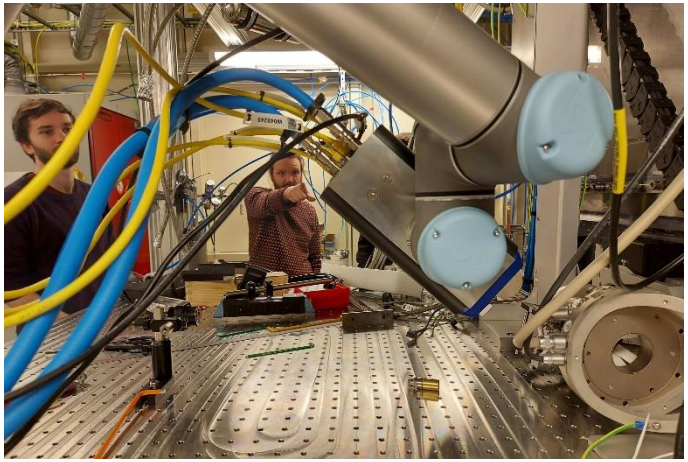


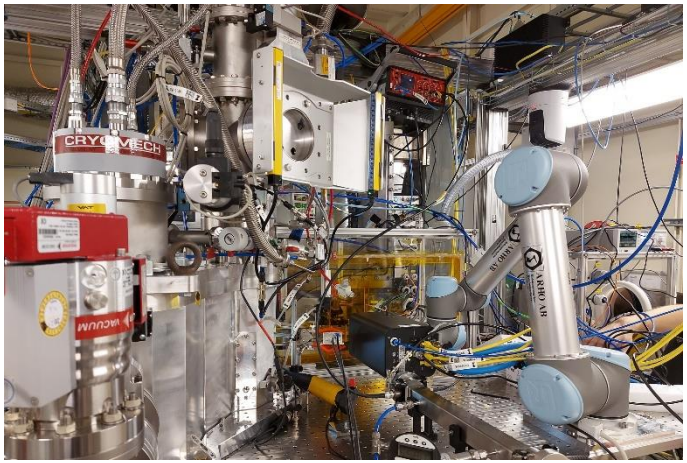


Balder Experimental hutch

Introduction: Current Status

- EIGER 1M detector purchased
- Triggering and measurement via control system
- Robot arm on Balder EH table: at present using collaborative robot UR5 borrowed from another project
- Data treatment: using Azint for post-processing (cluster, Jupyterhub)

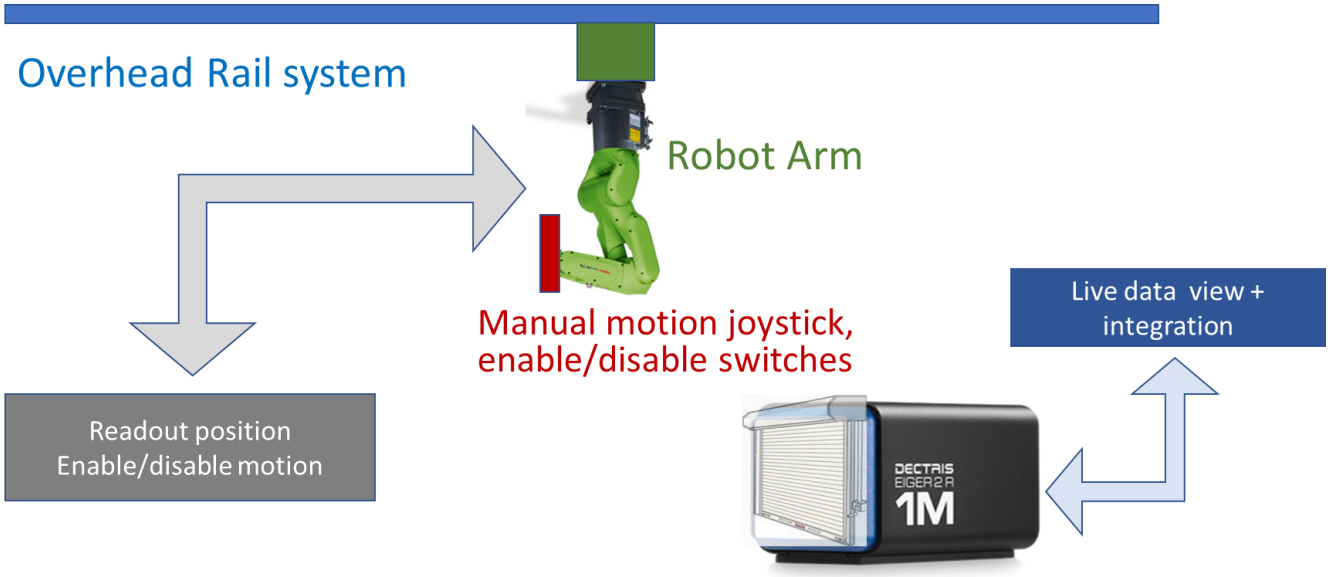




Balder Experimental hutch

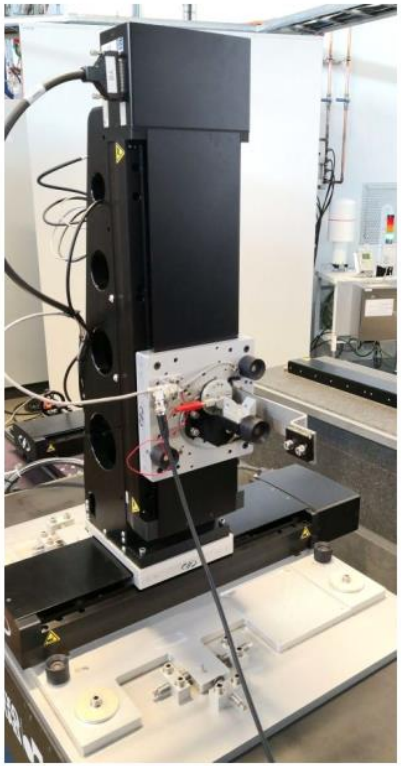
Introduction: Goals

- Summary



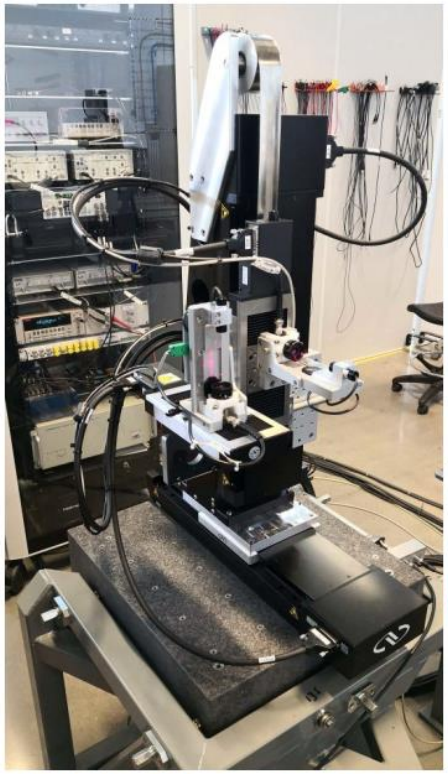
ID lab

Pulsed Wire System Setup

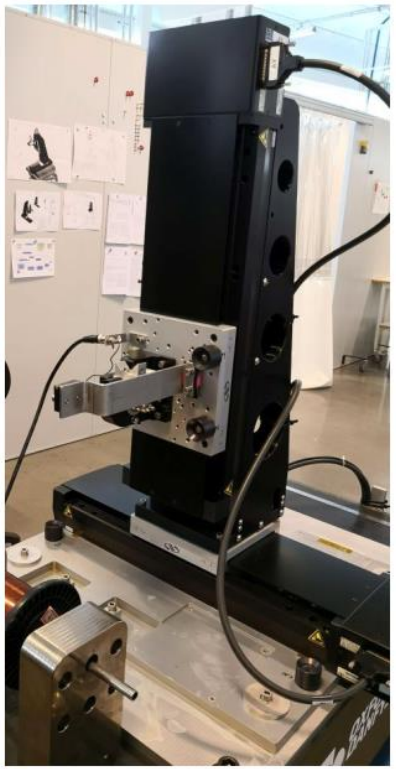


Tower B: Wire support

Device Under Test



Tower C: Laser Sensors

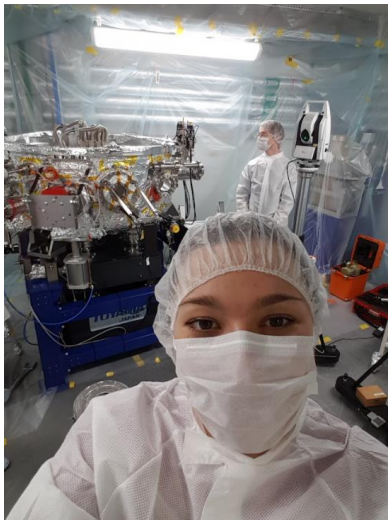
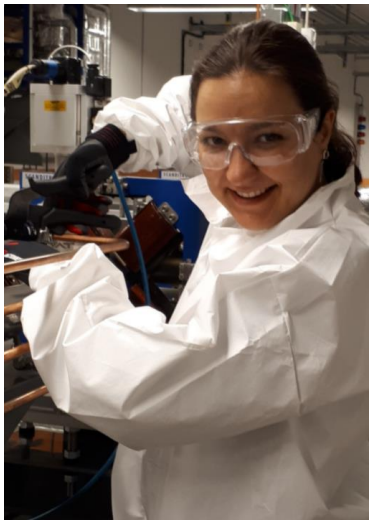


Tower A: Wire support

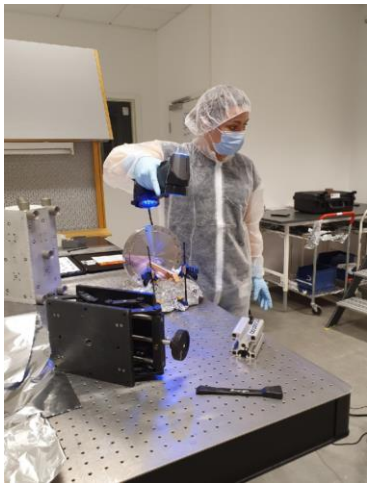
Conclusions

- **Centralization** of automation ideas (active progress) **locally.** "Menu" to the beamlines
- **Analysis of needs, requirements** (repeatable processes or individual for each user)**, and benefits** (why not manual)
- **ML, AI..** Trust, optimal application, experience
- **Centralization** of automation ideas (active progress) **globally.** Workgroup? Or whom to join?



Thank you!

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5. https://lup.lub.lu.se/student-papers/search/publication/9095103 **High Precision Robotic Manipulator for Bluelining at MAX IV**, Patil, Vinay Venkanagoud